Understanding the CMMI® Validation Process Area

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Application Domain

Government Communications Systems Division

· $1.1 B in Sales · 6,200 Employees · ISO 9001 · SEI CMM® Level 4

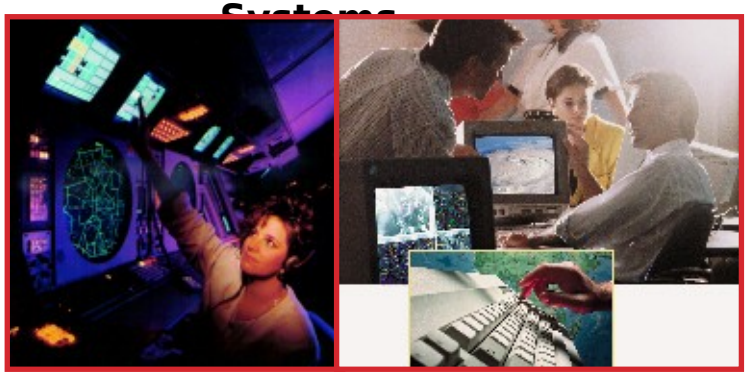
Aerospace & Ground Communication Systems

- **Advanced Avionics**
- **Airborne Communications**
- **Satellite Antennas**
- **Satellite Electronics**

- **C⁴I Systems**
- **Communications Systems (SATCOM and Terrestrial)**
- **Intelligence Systems**
- **Information Warfare and Network/Internet Security**
- **Commercial Systems and Products**

Integrated Information Communication Systems

- **Computer-Controlled, Highly Distributed Communications and Control Systems to Support Air Traffic Management**
- **High-Reliability Satellite Communications Systems to Support Air Traffic Management**
- **GPS Applications for ATM—Automatic Dependent Surveillance**



- **Data Handling and Control Systems**
- **Image Processing**
- **Meteorological Processing Systems**
- **Range Systems**
- **Air Traffic Control Systems**
- **Transportation Communications Systems**

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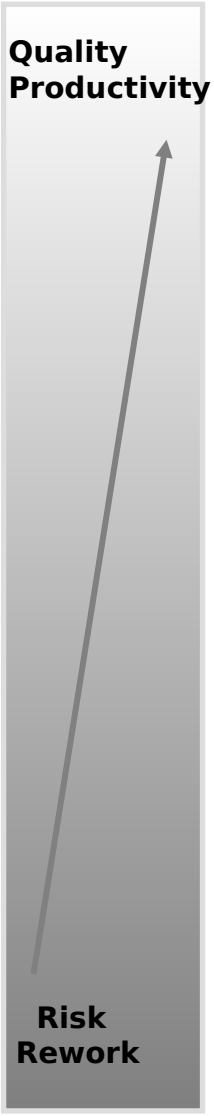
CMMI®-SE/SW (Staged Representation)

Maturity Level	Focus	Process Areas
5 Optimizing	*Continuous Process Improvement*	Organizational Innovation and Deployment Causal Analysis and Resolution
4 Quantitatively Managed	*Quantitative Management*	Organizational Process Performance Quantitative Project Management
3 Defined	*Process Standardization*	Requirements Development Technical Solution Product Integration Verification Validation Organizational Process Focus Organizational Process Definition Organizational Training Integrated Project Management Risk Management Decision Analysis and Resolution
2 Managed	*Basic Project Management*	Requirements Management Project Planning Project Monitoring and Control Supplier Agreement Management Measurement and Analysis Process and Product Quality Assurance Configuration Management
1 Initial		



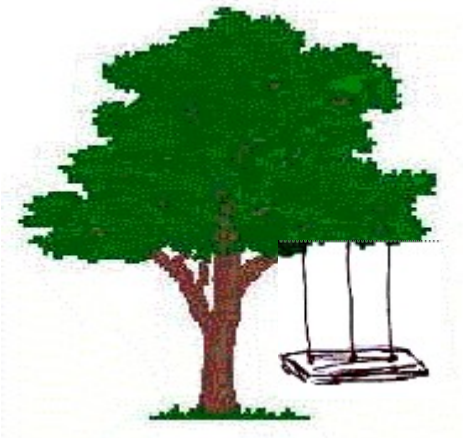
So… what is validation?

- **Don’t we just worry about that when the system is delivered?**
- **Isn’t that the customer’s problem?**
- **How is this related to verification ?**
- **When should I care about this ?**
- **Who performs these activities, and when ?**
- **When do we plan for these activities ?**
- **What parts of development are affected ?**
- **What if you don’t do both Validation & Verification ?**

Verification and Validation

Per The Requirements

If You Don't Do Both …



As Systems Specified It

As Engineering Designed It

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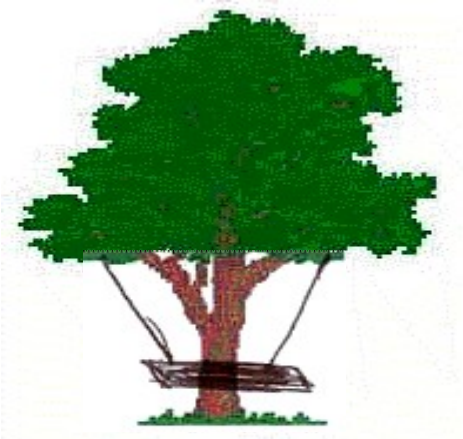
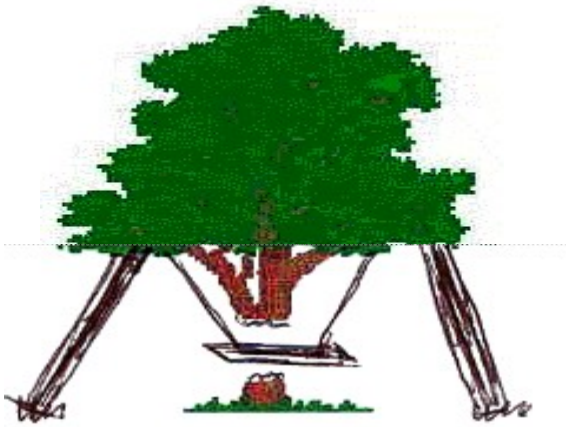
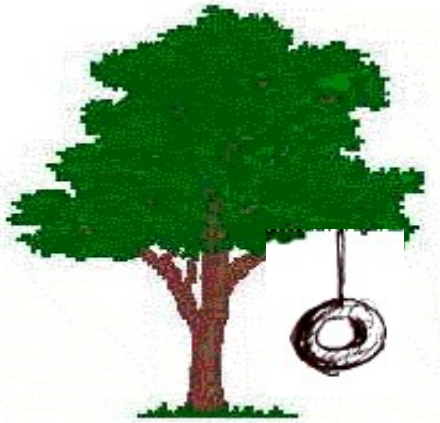
You Can Meet the Spec, But ...



As the Factory Built It



As Integration Installed It



What the Customer Wanted

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There are Differences

Verification	**Validation**
Do we meet the requirements?	*Do we understand the customer needs?*
Do we understand how it is supposed to perform?	*Do we understand what it is supposed to do?*
Do we comply with interfaces and standards?	*Do we understand the system context?*
Did we build the product correctly ?	*Did we build the correct product?*

There are Similarities

CMMI Verification PA		CMMI Validation PA	
SP1.1	Select Work Products for Verification	SP1.1	Select Products for Validation
SP1.2	Establish the Verification Environment	SP1.2	Establish the Validation Environment
SP1.3	Establish Verification Procedures and Criteria	SP1.3	Establish Validation Procedures and Criteria
SP3.1	Perform Verification	SP2.1	Perform Validation
SP3.2	Analyze Verification Results and Identify Corrective Action	SP2.2	Analyze Validation Results

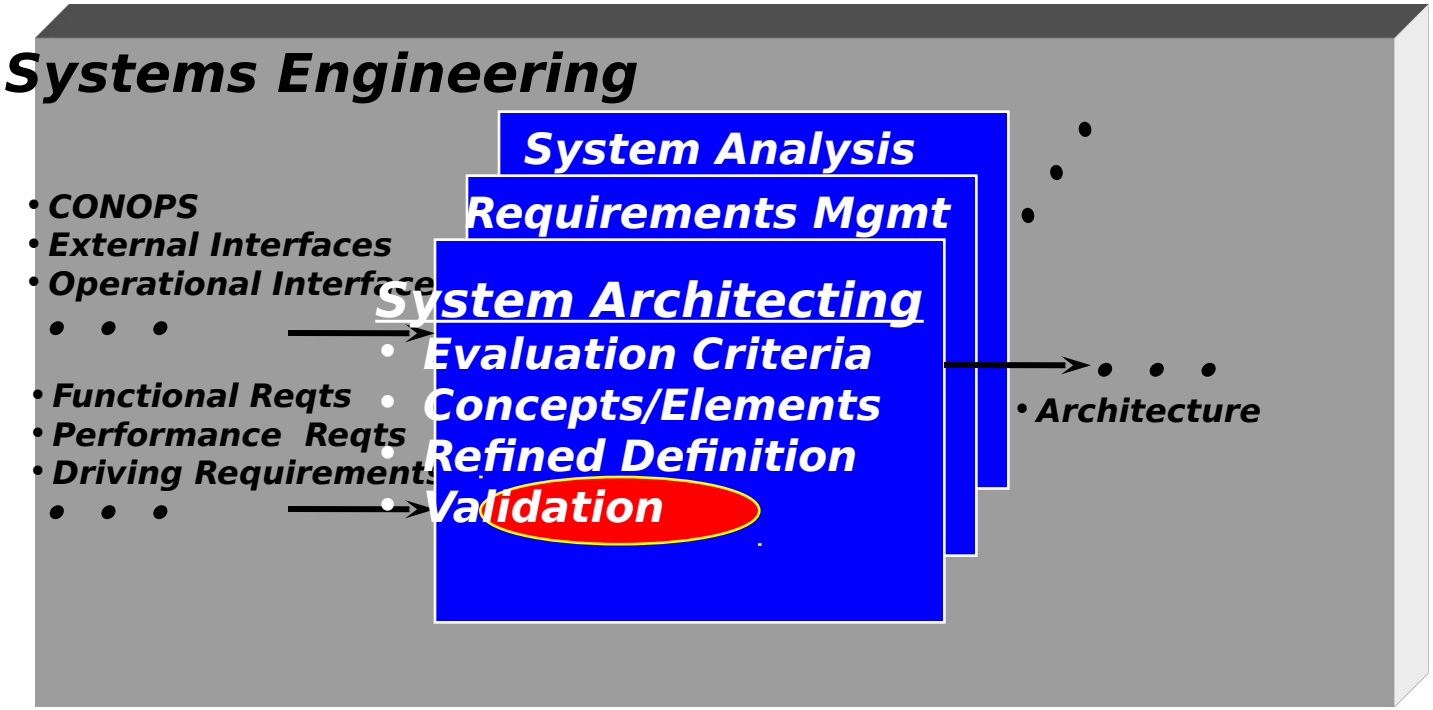
Verification and Validation processes

- Use similar techniques
- Both apply across the product lifecycle
- Can be applied concurrently
- Differences are in emphasis and intent

Scope of Validation

- **What is subject to validation?**
  - The organization defines the list of products to be validated from across the lifecycle
    - **Products**
    - **Product Components**
    - **Intermediate Work Products and Processes**
  - Selected on the basis of which are best predictors of how well the product component will satisfy user needs
- **Example products for validation:**
  - Operational Scenarios (Requirements Development PA)
  - Requirements (Requirements Development PA)
  - Designs (Technical Solution PA)
  - Integration procedures (Product Integration PA)
  - Validation environment & procedures (Validation PA)
  - Deliverable products (Product Integration PA)
  - Support documentation (Technical Solution PA)

Validation - Key to Architecting



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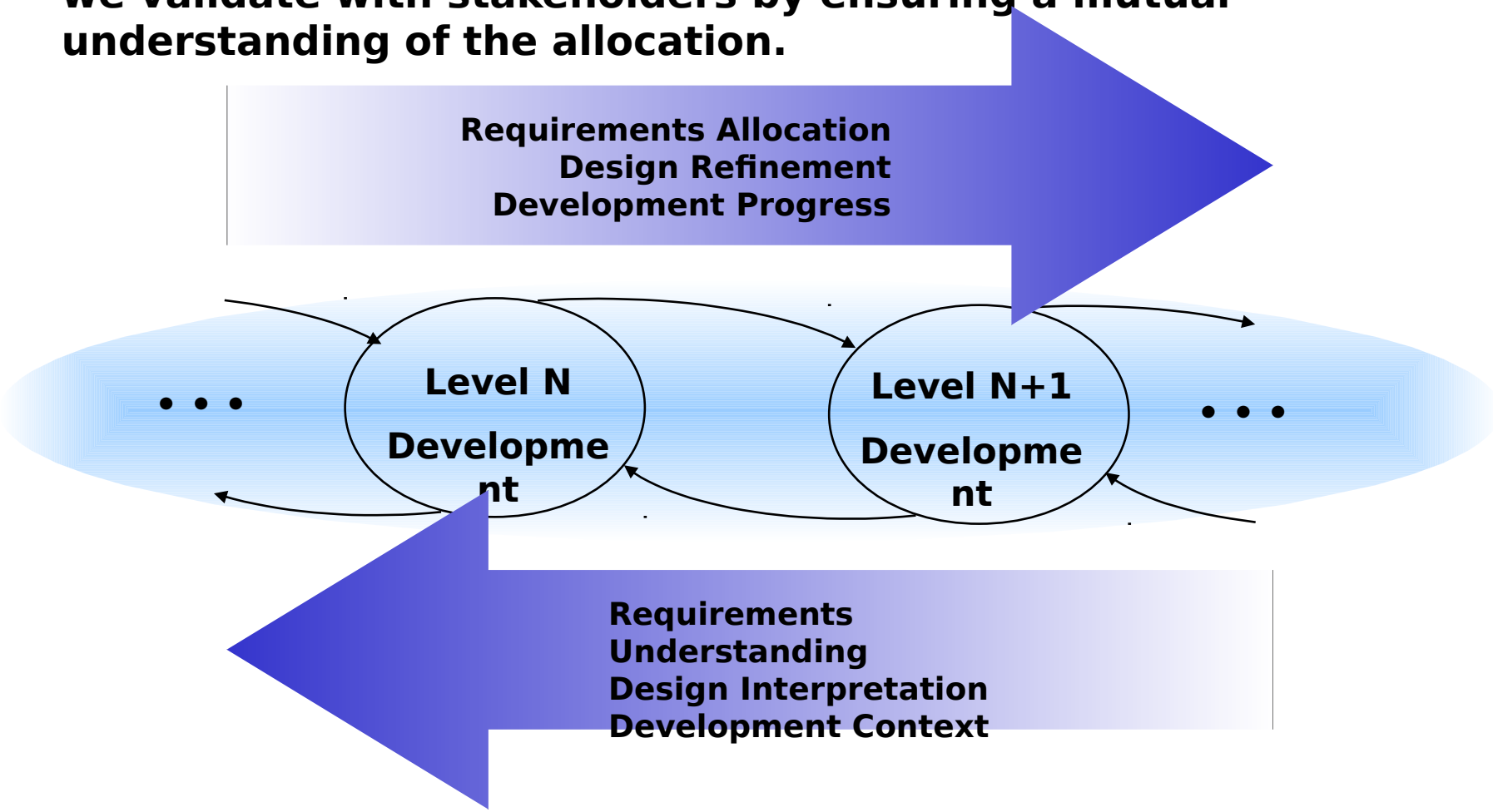
Validation - Each step of the process

As we allocate requirements and design to the next level, we validate with stakeholders by ensuring a mutual understanding of the allocation.



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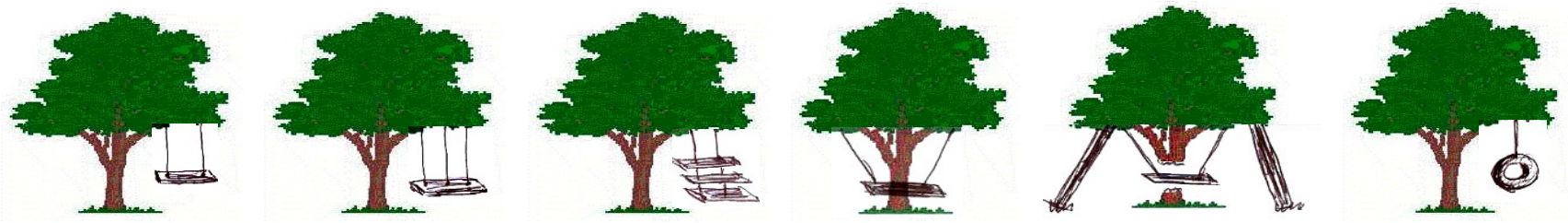
Validation - Throughout the Lifecycle

Phase	Validation	Verification
Business Acquisition	Understanding CONOPS Requirements	Preliminary Architecture Performance
System Requirements	Requirements	Testability
System Design	Architecture Configuration	Architecture Performance
Preliminary Design	Functional Design	CI Allocations
Detailed Design	Physical Design	CI Performance
Fabrication, Code, Integration	Documentation	Subsystem Level Performance
Verification	System Configuration	System Level Performance
Production	System Configuration	Repeatable Performance
Field Support	System Lifecycle	Sustained Performance

Verification without Validation

Without Validation as part of the process, you will waste:

- **Time**
- **Energy**
- **Money**
- **Resources**



… and still not get it right.

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